

Integrating Wind and Solar Energy In Mexico



2015 **Grupo Dragon Overview** Grid Wind Solar **Advanced Metering**

Grupo Dragon Overview



Grupo Dragon is a company dedicated to **generate** and deliver clean and sustainable energy

Our portfolio:

- Arriaga Wind Farm (28.8 MW)
 Chiapas, México
- Los Altos Wind Farm (50.4 MW)
 Jalisco, México
- Domo de San Pedro Geothermal (25 MW)
 The first prviate geothermal develoment in México
- More than 12 projects in pipeline

 Wind

 Geothermal

 Photovoltaics



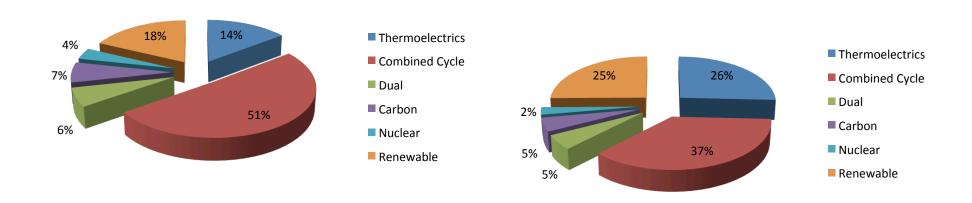
Mexico Energy Balance



México produces 258 TWh per year with an installed capacity of 54 GW

Electricity gross production GWh, 2014

Effective installed capacity in MW, 2014



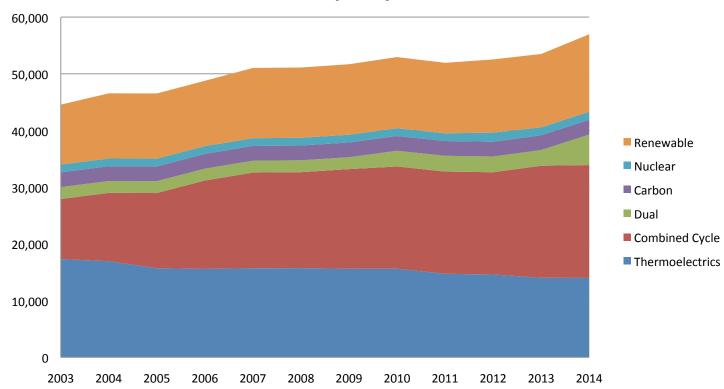
Source: Secretaria de Energía (www.sener.gob.mx)

Mexico Energy Balance



Mexico has increased 12 GW from 2003 to 2013, being Wind and Combined Cycles the technologies with greater growth

Efective installed capacity in MW, 2003 - 2014



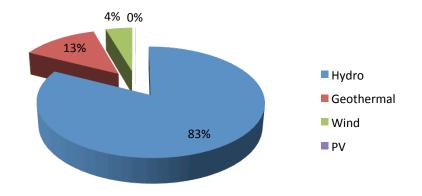
Source: Secretaria de Energía (www.sener.gob.mx)

Renewable energy balance

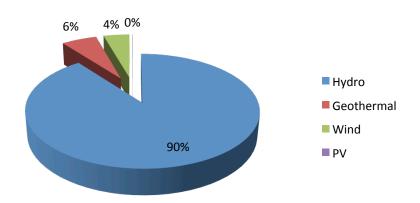


Only 18% of the electricity is produced throw a renewable source

Gross electricity production in GWh, renewables 2014



Efective installed capacity, renewables 2014



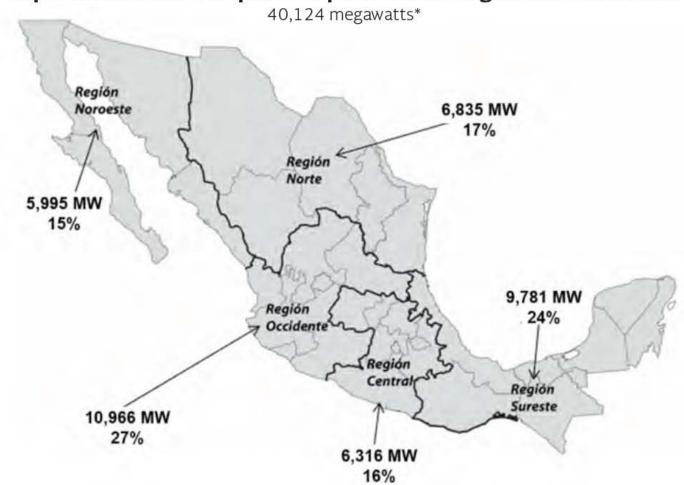
Source: Secretaria de Energía (www.sener.gob.mx)

^{*}Hydro includes power plants smaller and greater than 30 MW

Mexico National Grid



Capacidad efectiva en operación por Gerencia Regional de Producción



Fuente: Dirección de Operación, Comisión Federal de Electricidad. Diciembre 2014. Cifras redondeadas.

* Incluye 231 MW de plantas móviles. No incluye 1,400 MW de la Central Nucleoeléctrica de Laguna Verde ni a los Productores Independientes de Energía (PIE).

Source: Comisión Federal de Electricidad, Informe Anual (www.cfe.gob.mx)

Mexico National Grid

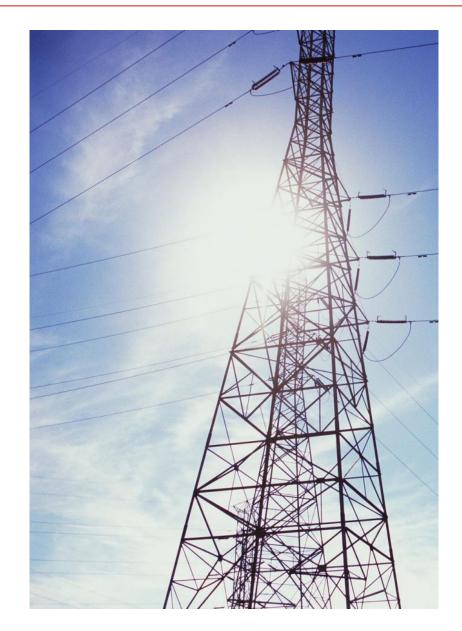


Distribution infrastructure

- 1910 substations
- 57,000 km of transmission lines
 - 52,000 high voltage
 - 445,000 medium voltage
 - 320,000 low voltage
- Transmission energy capacity of 250 TWh

Transmisión & distribution projects

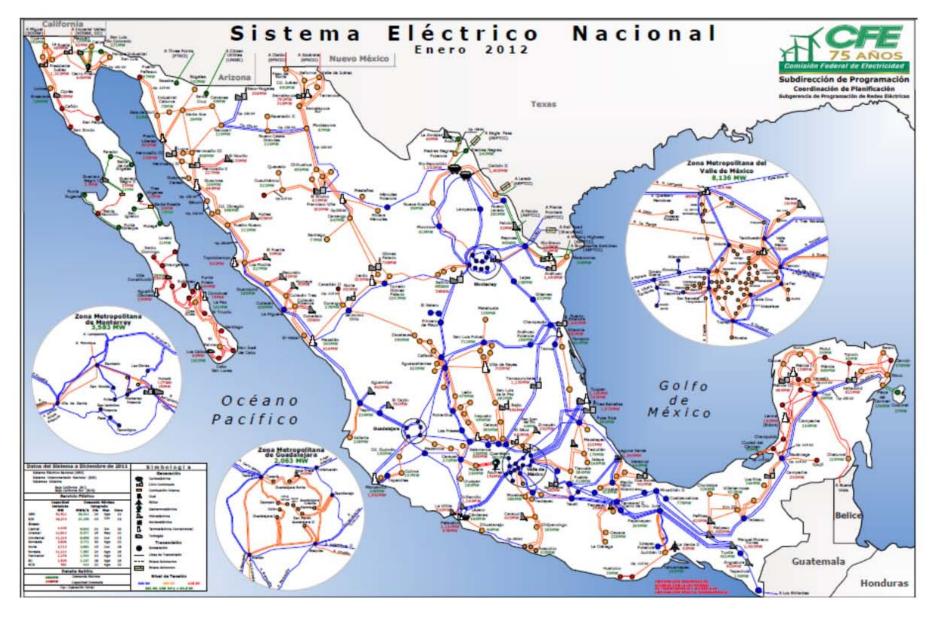
- More than 1,000 km under construction
- More than 400 km in tender
- Contribuition to Central América Grid –
 Connection project (SIEPAC)
- Energy loss reduction (Grid Upgrade)



Source: Comisión Federal de Electricidad, (www.cfe.gob.mx)

Mexico National Grid





Energy Reform



- CFE -> Productive State
 Enterprise
- Private enterprises can invest as:
 - Power generator
 - Electricity Marketing & Supply
- Renewable energy balance must achieve 20%, 2025

Opportunity for private equity funds & enterprises to invest in renewable and conventional power generation



Mexico Wind Overview



- Mexico has an installed capacity arround 2,500 MW
- Most of the installed capacity is located in the state of "Oaxaca" in a wind zone called "Itsmo de Tehuantepec" with capacity factors greater than 40%
- New potential areas have been discovered in the last years
- Mexico wind potential is greater than 50,000 MW
- The goal is to achieve 12,000 MW for 2020



Source: Asociación Méxicana de Energía Eólica (AMDEE; www.amdee.org)

Mexico Wind Overview



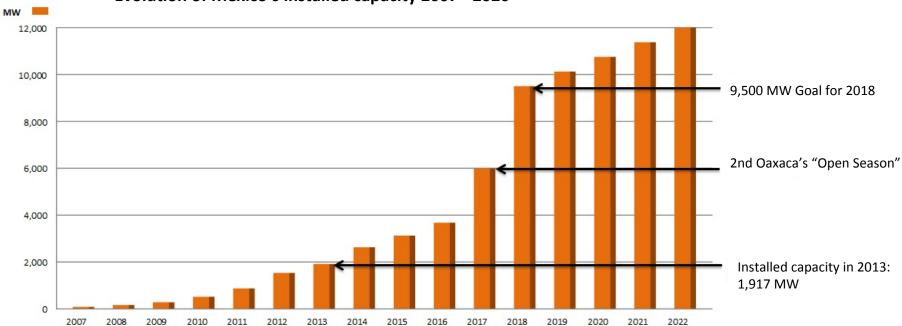


Source: Asociación Méxicana de Energía Eólica (AMDEE; www.amdee.org)

Mexico Wind Overview







Mexico Solar PV Overview



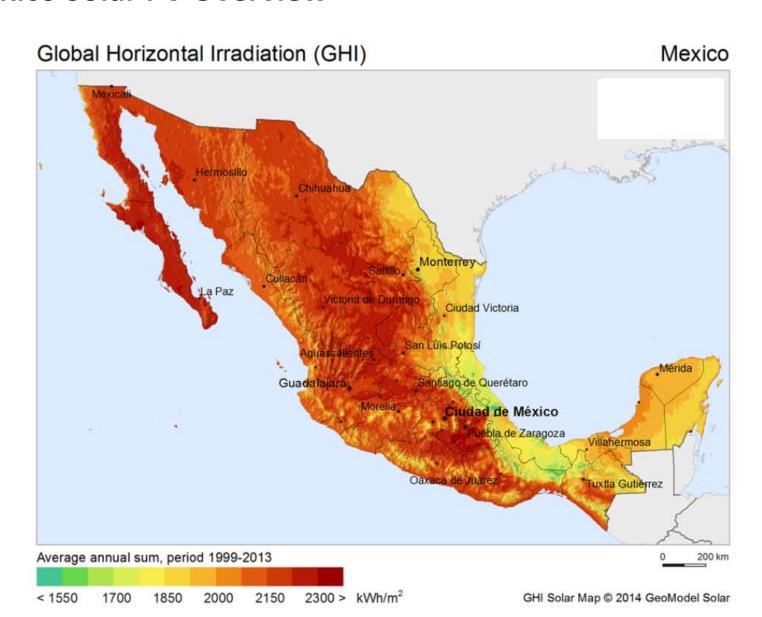
- México is among the 15 countries with more photovoltaic potential
- Radiation average of 5.5 kWh/m²; maximum greater than 7.5 kWh/m²
- Goal is to achieve 1.5 GW from 2012 2020
- Applications:
 - **Utility:** 38 MW installed capacity, more than 150 MW under construction
 - Residential: More than 40 MW installed capacity (Projects smaller than 1 MW)



Source: SENER "Iniciativa para el desarrollo de las energías renovables en México: Energía solar"; photon.info

Mexico Solar PV Overview



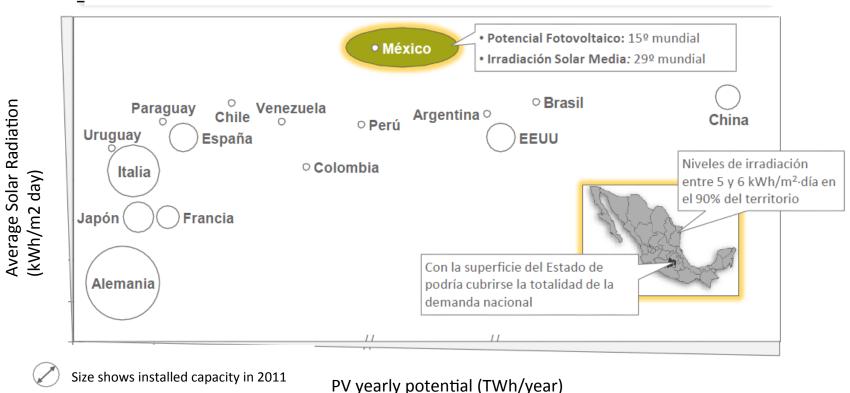


Source: solargis.info

Mexico Solar PV Overview



International comparison between average radiation and PV installed capacity in 2011



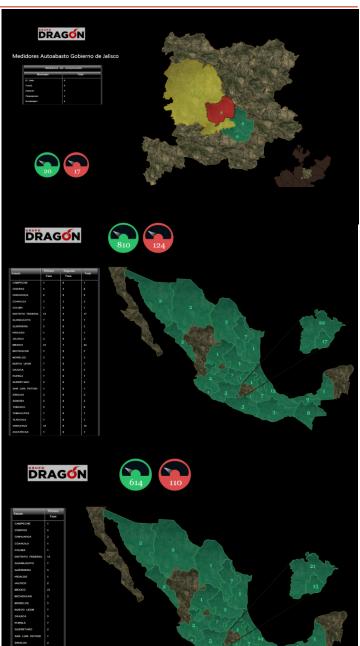
Source: SENER "Iniciativa para el desarrollo de las energías renovables en México: Energía solar"

Grupo Dragon and Advanced Metering Infrastructure



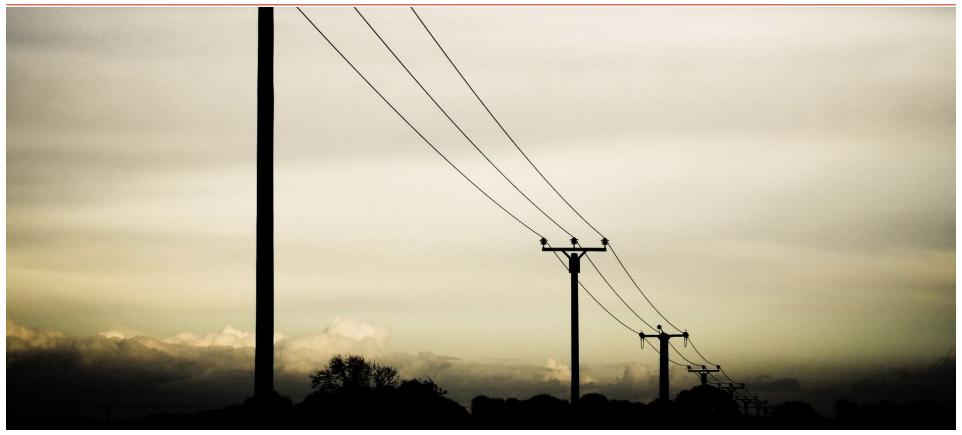
Today, Grupo Dragón is the private leader, in Advanced Metering Infrastructure with almost 2,000 sites in Mexico and growing up.

This leadership gives certainty to Dragon Group on measurement data for billing, data for loss reduction, fraud detection capacity,...



Energy Reform and AMI





The Energy Reform obligate Governmental institutions to improve electricity distribution and control, and, one piece of this improvement is the installation of advanced metering infrastructure to transform the grid to smart grid.

Energy Reform and AMI



The AMI is the first step to improve the grid efficiency and transform It to a Smart Grid

- •Diversifying energy sources, increasing clean technologies
- Increasing efficiency levels and reduce consumption
- •Operate an efficient, reliable and secure National Grid
- Provide quality and competitive energy
- •Provide technological development and human resources for the energy sector



AMI and New market



How the AMI could accelerate the new market in México?

- •Allows measure in order to improve grid control.
- •Electricity supplier operations more flexible and at low cost.
- •Second by second access to grid information to improve operations and administration.
- •Grid planning improved reducing costs of power generation, distribution and supply.

